



10 years of the

hot birds project

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In mid-2009, the late Phil Hockey – then director of the Fitztitute – and Andrew McKechnie of the University of Pretoria (UP) spent two days in Phil’s office developing a research programme focusing on desert birds and climate change. Our first field season during the summer of that year involved a team of three researchers based at Tswalu Kalahari Reserve: Fitztitute postdoctoral fellows Susie Cunningham and Rowan Martin and UP doctoral student Ben Smit. In the 10 years since, the Hot Birds Research Programme (HBRP) has grown

above *The Southern Yellow-billed Hornbill has emerged as an important study species on account of the dramatic negative effects of hot weather on its breeding success.*

into a team of about 20 people based at the Fitztitute, UP, National Zoological Garden and Rhodes University, with a network of collaborators spanning several overseas universities.

During the HBRP’s first decade, we have learnt much about how higher temperatures affect desert birds. Small birds face a significant risk of lethal dehydration on very hot days; evaporating water to lose heat, often by panting, is the only way birds can avoid lethal heat stress. In extremely hot weather, small birds can die of dehydration in a matter of hours.

In the intensely hot deserts of the American south-west and the interior of Australia, climate change is producing conditions under which catastrophic

mortality events involving thousands – occasionally millions – of birds will occur far more often than in the past. Some range-restricted Australian species could be driven to extinction within a matter of days in extreme heatwaves. If this sounds alarmist, consider that Australia lost one third of its entire population of a flying-fox species in just two days of extreme heat late last year.

A second timescale over which the effects of global heating are apparent involves processes that operate over days to weeks. Susie Cunningham, now a lecturer at the Fitztitute, has led the HBRP’s behavioural ecology programme since Phil Hockey’s untimely death in 2013. Studies by Susie and her students have revealed that desert birds face strong

trade-offs between body temperature regulation and foraging. High temperatures force Kalahari species such as Southern Pied Babblers, Southern Yellow-billed Hornbills and Southern Fiscals to seek shade and engage in panting and wing-drooping behaviours to increase rates of heat loss; these behaviours are often incompatible with foraging and result in vastly reduced rates of food and water intake.

A pattern consistently emerging from these studies is that on very hot days birds cannot acquire enough food during daylight hours to balance overnight losses, with each 24-hour period thus involving a nett loss of body mass. Reduced intake of food by parent birds also means a reduction in their ability to provision dependent chicks in the nest. Combined with the direct physiological costs of heat exposure, inadequate food provision means chicks grow more slowly and fledge smaller, lighter and later, or not at all.

The consequences are twofold: in the first instance small, weak individuals may have poor long-term survival, reducing their ability to contribute to population persistence. Second, in many species, including Southern Yellow-billed Hornbills and Southern Pied Babblers, larger individuals have a better chance of breeding successfully. Chicks that fledge with severely compromised body size because of hot conditions experienced in the nest may subsequently struggle to raise their own young, even if they make it to adulthood themselves. Heatwaves during breeding therefore have the potential to insidiously erode populations of birds through diminished recruitment and repeated breeding failure. These chronic, sub-lethal effects of very hot weather may not have the visual impact of birds dropping dead en masse, but they are no less consequential for the persistence of populations in desert regions.

During its first decade, the HBRP has seen the training of 34 MSc and PhD students and the publication of 74 papers in scientific journals. A fitting



above *To mark the 10th anniversary of the Hot Birds Research Project, the team held a highly successful workshop in the Namib Desert earlier this year.*

right *Studies of Southern Pied Babblers are yielding novel insights into how high temperatures affect cooperative breeding systems.*

highlight of 2019 was the publication of a paper in the high-impact international journal *Proceedings of the National Academy of Sciences*. Shannon Conradie and her co-authors drew together many of the findings of the physiological and behavioural studies that we have conducted in recent years and synthesised them to conduct a risk assessment for southern Africa’s desert avifauna. The results are profoundly troubling: by the end of the century many of the birds that are currently common in the Kalahari will no longer be able to persist there.

To celebrate the 10th anniversary of the HBRP, in July this year we held a workshop involving the entire team at what is quite possibly the most spectacular venue imaginable for a group of desert ornithologists: the legendary Gobabeb research station deep in the Namib Desert. One of the key topics we focused on was finding new approaches to modelling the impacts of higher temperatures without first needing to conduct time-consuming and expensive studies of every species.



SIMON ALLEN

The workshop provided an opportunity for every member of the group to present their research and it was followed by a day of fruitful discussions about our progress to date and the emerging questions that the HBRP will tackle over the next decade. On the last evening of the workshop, we climbed one of the Namib’s massive sand dunes, armed with five bottles of red wine in a backpack to drink our annual toast to Phil Hockey. As the sun set over the vastness of the sand sea, we reflected on Phil’s vision for the project and how pleased he would have been had he lived to see what it has become.

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